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Can an Improved Disclosure Mechanism Moderate Algorithm-Based Software Patentability in the Public Interest?

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CAN AN IMPROVED DISCLOSURE MECHANISM MODERATE ALGORITHM-BASED SOFTWARE PATENTABILITY IN THE PUBLIC INTEREST?

BY VINICIUS SALA¹

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I. INTRODUCTION

The last thirty years have witnessed major developments in the technological sector. These developments have paved the way for the emergence of exciting new technologies and algorithm-based software such as autonomous vehicles,² automated stock traders,³ and autonomous weapons.⁴ Scholars and researchers around the globe are now debating topics such as the Internet of Things, smart cities, data privacy and algorithms ethics. Moreover, software is now capable of reading large amounts of data sets and, consequently, is being utilized in arguably all facets of human life; including, but not limited to, health sciences, diagnosis methods, financial analysis systems, military features and connected cities.⁵

How will these same scholars and researchers now respond to such developments as it relates to intellectual property law? Currently, our intellectual property laws protect inventions within the frameworks of copyrights, patents, and trademarks. Software can be protected under a copyright regime or by filing a patent; depending on the specification of the computer program and its industrial applications. Therefore, the broader purpose of this article is to dive into the patent protection system and its most critical institute: disclosure. Disclosure will play a pivotal role in the answer to this article's main question: what should be done within the patent system to assimilate this new technologically-advanced environment?

² See generally *2019 Autonomous Vehicles Readiness Index*, KPMG INTERNATIONAL, <https://home.kpmg/content/dam/kpmg/xx/pdf/2019/02/2019-autonomous-vehicles-readiness-index.pdf> (last visited Nov. 2, 2019).

³ Jay Somaney, *Is Our Stock Market Rigged?*, FORBES (Aug. 24, 2015, 1:03PM), https://www.forbes.com/sites/jaysomaney/2015/08/24/is-our-stock-market-rigged/#76f9bfc347ca_

⁴ Ingvid Bode & Hendrik Huelss, *Autonomous weapons systems and changing norms in international relations*, 44 REVIEW OF INTERNATIONAL STUDIES 393–413 (2018).

⁵ See generally Martin Dodge & Rob Kitchin, *Code, space and everyday life*, CASA WORKING PAPER SERIES 81, http://www.casa.ucl.ac.uk/working_papers/paper81.pdf (last visited Dec. 17, 2019).

A. OUR ROADMAP

This article intends to first provide a practical assessment regarding the normative basis of the disclosure requirement in the patent system, and to then propose a new dialogue with the software market and day-to-day practice. By no means does this article aim to provide a solution for such an evolving topic, nor it does pretend to deeply discuss a broader reform of the whole system. Instead, the main goal of this article is to analyze disclosure, propose improvements to the current system and to simulate how a facilitated view of software patentability can positively impact and eventually address some of the challenges posed by innovation.

To achieve the above-mentioned goal, this article is divided into five main sections. Section II will investigate the economic basis of the patent system and explore how disclosure affects this understanding. To do so, this article will articulate natural rights and ethical reward-related theories as the foundations of the patent system.

Section III will focus on disclosure. As such, it will reconstruct the concept of the institute, analyze the justification theories behind the disclosure requirement, describe three typical cases in which the grant of a patent will be denied due to lack of disclosure (classical insufficiency, excessive of breadth and ambiguity) and, finally, show how these theories aim to promote societal welfare.

Section IV will present, debate and connect five strategies presented by Jeanne Fromer,⁶ Jay Kesan,⁷ and Samuel C. Adams⁸ that could potentially enhance the current disclosure system.

⁶ See Jeanne C. Fromer, *Patent Disclosure*, IOWA L. REV. (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1116020 (last visited Nov. 10, 2019).

⁷ Jay P. Kesan, *Carrots and Sticks to Create a Better Patent System*, 17 BERKELEY TECH. L. J. 763, 763-797 (2002), <https://ssrn.com/abstract=305999> or <http://dx.doi.org/10.2139/ssrn.305999>.

⁸ Samuel C. Adams, *Law and Economics of Software Patent Disclosure*, THE MUNICH INTELLECTUAL PROPERTY CENTER (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1415722 (last visited Nov. 10 2019).

Taking into account that these lecturers did not present their theories combined, the purpose of the third section is also to demonstrate how these improvements can be jointly implemented and why it is unlikely that these measures would increase patent grant costs, create unnecessary bureaucracy or demotivate users of the patent system.

Section V intends to examine both the current landscape of software patentability and the circumstances in which software is eligible to benefit from the patent monopoly.

Section VI will propose a dialogue between the social benefits inherent to an optimized disclosure process and the challenges that sophisticated software create; suggesting a new vision for the patentability of software as a policy strategy to accelerate development. To do so, a critical analysis of autonomous vehicle algorithm-based software will be applied under the disclosure of rational benefits, suggesting that copyright protection might undervalue the benefits of disclosure.

This article will then apply commentators and cases from the US and Europe,⁹ taking into account that these are major jurisdictions and precursors of the current patent system. While it is important to acknowledge that these two systems hold different views of software patentability, the concepts and assumptions made in this study are likely to apply to any patent system grounded on the social bargain of monopolistic protection to the inventor and disclosure of knowledge to society.

We will begin by clarifying exactly what this phrase “patent system” means for the purposes of this study.

⁹ *Patents*, WORLD INTELLECTUAL PROPERTY INDICATORS, http://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2017-chapter2.pdf (last visited Nov. 11, 2019) (articulating that during 2016, the Europe Patent Office and the United Patent Office estimated that they accumulatively received 24% of the total amount of patents application in the world).

II. THE PATENT SYSTEM

A. SOCIAL BARGAINING SCHEME

The patent system is a social bargaining scheme developed to motivate individuals and to create, innovate and disclose such creation for the whole of society.¹⁰ In return for such disclosure, inventors will receive a monopolistic protection of their invention for twenty years. In other words, if someone discloses an invention under a patent regime, no one else will be able to economically explore the invention because the inventor possesses a monopoly over it.¹¹

Influenced by this scenario, our defined patent system carries an expectation of achieving the right balance between both the social benefits of invention disclosure and the monopolistic incentive granted to the inventors.¹² The growing number of patents being litigated is a signal that the system presents concerns for inventors that need to be better understood to be fully addressed.¹³

B. EMERGING COMPUTER TECHNOLOGIES

One of the sectors most impacted by the growing number of patent litigation cases is computer technologies. This raises the issue of whether or not the rate of innovation is increasing or decreasing as a result of deficiencies in the system. In other words, the centenary patent system is under close examination by its relevant stakeholders (e.g., policy makers, inventors, patent lawyers, intellectual property professors) who are now trying to understand if the above-mentioned balance is still accurate. After all, the aim of these stakeholders is to understand how this social

¹⁰ LIONEL BENTLY ET AL., INTELLECTUAL PROPERTY LAW 393 (5th ed. 2018).

¹¹ *Id.*

¹² *An Overview of Patent Litigation Systems Across Multiple Jurisdictions*, WORLD INTELLECTUAL PROPERTY INDICATORS, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2018-chapter1.pdf (last visited Nov. 3, 2019).

¹³ *Id.*

bargain (which is inherent to the patent system) can effectively contribute to the progression of the software industry.¹⁴

C. ECONOMIC BASIS

The patent system relies, on one side, on the contribution provided to society when an invention is published. On the other side, it relies on incentives (e.g., a monopoly for twenty years) granted to the patentee who has submitted a patent application and disclosed how he or she has conceived the invention. In 1950, Fritz Machlup and Edith Penrose¹⁵ explained four main types of arguments that justify the creation of patent rights. Each argument is equally valid today.

Argument type one:

“A man has natural property right in his own ideas. (...) Hence enforcement of exclusivity in the use of a patented invention is the only appropriate way for society to recognize this property right.”¹⁶

Argument type two:

“Justice requires that a man receive, and therefore that society secure to him, reward for his services in proportion as these services are useful to society. Inventors render useful services.”¹⁷

¹⁴ *Patents*, WORLD INTELLECTUAL PROPERTY INDICATORS, http://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2017-chapter2.pdf (last visited Nov. 11, 2019) (articulating that Computer Technology patent applications account for 7.4% of all the applications published worldwide).

¹⁵ See generally Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 THE JOURNAL OF ECONOMIC HISTORY 1, 1-29 (1950).

¹⁶ *Id.* at 10.

¹⁷ *Id.* at 10.

Argument type three:

“Industrial progress is desirable to society. Inventions and their exploitation are necessary to secure industrial progress.”¹⁸

Argument type four:

“Industrial progress is desirable to society. To secure it at a sustained rate it is necessary that new inventions become generally known as parts of the technology of society. In the absence of protection against immediate imitation of novel technological ideas, an inventor will keep his invention secret.”¹⁹

Within the context of these four arguments, Samuel C. Adams²⁰ articulates four accepted justifications of the economic basis of patent systems. Two are connected with ethical considerations and the other two are connected with property rights.

The first justification is based on the natural rights of individuals.²¹ It arose from French patent law and sustains that, just like tangible property, patent rights (a.k.a. intangible property) shall be protected as long as the property is a result of the labor of an individual.²² While this theory does not require further justification, since it is based in natural rights principle,²³ an important characteristic of the patent system is the fact that patent rights are non-rivalrous and non-excludable; this in contrast to tangible property rights which are rivalrous and excludable.²⁴

¹⁸ *Id.* at 10.

¹⁹ *Id.* at 10.

²⁰ *See* Adams at 1-6.

²¹ *Id.* at 2.

²² *Id.*

²³ *Id.*

²⁴ Alan J. Devlin, *The Misunderstood Function of Disclosure in Patent Law*, 23.2 HARV. J. OF L. & TECH. 401, 413 (Spring 2010), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1490722 (last visited Nov. 10, 2019).

In applying this first theory, we note a setback. Had Leonardo Da Vinci described how to build a parachute in the fifteenth century in a regular and accessible language, anyone could have used those specifications and drawings (i.e., the intangible property) that he drafted and disclosed, and perhaps built their own parachute. Consequently, once someone is using the parachute (i.e., the tangible property), that very same asset cannot be used by another individual at the same time.²⁵ This application of the first theory fails to provide empirical proof of ownership and, consequently, does not provide a social welfare in exchange for the right of exploitation of an idea.

This gap leads to the second explanation of the economic basis of the patent system: the utilitarian approach.²⁶ The utilitarian-oriented explanation of the patent system provides that a resource should be employed as efficiently as possible.²⁷ This would allow the inventor to take advantage of the creation.²⁸ This analysis is questionable, because it portends that there is no use in a patent if the invention happens without incentive. While this assessment might sound attractive, the reality and limitation of this approach is that it relies on the fact that disclosure poses an incredible value, not only in the speed in which innovation can reach the market, but also in further innovation that can be spawned from the invention. In other words, if the patentee does not have incentive to patent an invention, it is possible to affirm that a group of inventions would never come out and perhaps no one would benefit from that knowledge.

Adams' final method to assess the economic basis is through the lens of ethical rewards.³⁰ Whereas the inventor should receive an award to the extent that he or she provides a valuable

²⁵ *Parachute*, THE BRITISH LIBRARY, <http://www.bl.uk/onlinegallery/features/leonardo/parachute.html> (last visited Nov. 11, 2019).

²⁶ Adams at 3.

²⁷ *Id.*

²⁸ *Id.*

³⁰ *Id.* at 4.

contribution to society's general knowledge, the risk of this theory is that the system grants incentive for inventions that should not be eligible for this protection.³¹ This theory acknowledges that both tangible and intangible properties hold certain singularities that the inventor should be awarded at the same time. In essence, it presents an inconsistency between the reward to the inventor and the effective contribution.

III. DISCLOSURE: A FOUNDATION FOR THE PATENT SYSTEM SOCIAL BARGAIN

Disclosure is a fundamental step in the patent system. To achieve the social value desired by society, the inventor must disclose their knowledge. This increases the likelihood that everyone can benefit from their achievements.

According to Bently, Sherman, Gangjee & Johnson's research published in Intellectual Property Law: "In particular it is said that patent act as incentive to individuals or organizations to disclose information that might otherwise have remained secret. Patent also encourages information to be disclosed in a way that is practically useful."³² This practical use is a pivotal component of the patent system and completely connects with both Adams' justifications as well as the social benefits of disclosure.

Although this concept of "benefits of disclosure" is self-sustained, it is of fundamental importance to point out a divergent opinion regarding the role of disclosure in the patent system. While most scholars sustain that disclosure should be the central element of the system, Alan

³¹ *Id.*

³² BENTLY ET AL. at 397-398.

Devlin, an American lecturer, believes that there is a misconception in the role of disclosure within patent system.³³

According to Devlin, disclosure will only have value for an invention that is not self-revealing; otherwise, there is no benefit for the society.³⁴ An invention that is self-revealing allows another to reverse engineer it and obtain enabling knowledge when the invention enters the market.³⁵ In his own words:

“The disclosure requirements of § 112³⁶ disincentivize patentability in inverse proportion to the self-revealing quality of the relevant invention (...) the prospect of a twenty years monopoly over an invention that others could otherwise readily appropriate will greatly exceed that cost in a monopoly.”³⁷

Devlin goes further and sustains that disclosure should be treated as an ancillary feature. He argues that, in reality, disclosure may often be in conflict with the incentive to invent. Therefore, it is a mistake to treat incentive and disclosure goals with the same level of importance.³⁸ The author reaches this conclusion by analyzing conflicts within the patent system. One of these conflicts occurs when innovators try to expand the scope of protection by applying broad language in patent claims.³⁹ Additionally, the Patent Office might overlook these claims,

³³ Devlin at 418.

³⁴ *Id.*

³⁵ *Id.*

³⁶ United States Patent Act §112: The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

³⁷ Devlin at 419.

³⁸ *Id.* at 404.

³⁹ *Id.* at 410-412.

granting the patent and creating a disproportionate cost for society; which will now bear the disadvantages of a low-quality patent.⁴⁰

While nobody would cast doubt regarding the assertion made by Devlin about the rising number of broad and poor patents, the reality is that the solution to this problem will not involve deferring an ancillary role to the disclosure requirement. The solution for broad and poor patents should, instead, go in the opposite direction of giving an ancillary role to the disclosure requirements. This solution encompasses further development of the Patent Offices and grants additional resources for these officers to better assess the patent application process. These proposed improvements will play a beneficial role in the assurance of the notice function of the patent system.

Because patent offices and courts devote significant resources to explain the standards of disclosure, the following subsection will assess the required qualifications of sufficiency of disclosure within a patent system and introduce important cases connected to the topic.

A. A DEFINITION OF EFFECTIVE DISCLOSURE UNDER THE SUFFICIENCY CRITERIA

A fundamental part of the social bargain contract involves investigating the basis of disclosure. Such an investigation will be of paramount importance to understanding what sufficient disclosure accounts for and how such a concept is applied by courts and patent offices.

Article 83 of the European Patent Convention provides that: “the application shall disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.”⁴¹

⁴⁰ *Id.* at 404.

⁴¹ *Article 83 – Disclosure of the invention*, EUROPEAN PATENT OFFICE, <https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar83.html> (last visited Dec. 17, 2019).

As we can infer from the text, this disclosure narrows the range of protections of certain patents. The underlying reason for this rests on the fact that the system assumes that, when patentees disclose their invention, they are sharing their knowledge. Additionally, they are allowing other researchers to build upon the invention, learn and make additional inventions that will be beneficial to the society.

Concomitantly, these same patentees take advantage of the prior art and knowledge that had been previously disclosed. For this reason, the concept of a person skilled in the art is an important part of the construction of the limits of the disclosure and the patent protection. This is what separates the obvious from the non-obvious⁴² or; in other words, this is what is going to isolate the real contribution of the invention for the scientific community.

Bently, Sherman, Gangjee & Johnson clarify that it “does not matter if the invention arose as a result of years of research by a team of leading experts, by chance, or by an unskilled person. All that matters is whether the person skilled in the art would consider the invention to be non-obvious.”⁴³

Indeed, as articulated by the European Patent Office Technical Board, the identification of a skilled person requires careful consideration.⁴⁴ According to the Technical Board Decision: “The skilled person will be an expert in a technical field. If the technical problem is concerned with a computer implementation of a business, actuarial or accountancy system, the skilled person

⁴² According to the European Patent Convention, in its Article 56: “An invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art. If the state of the art also includes documents within the meaning of Article 54, paragraph 3, these documents shall not be considered in deciding whether there has been an inventive step.” *Article 56 – Inventive step*, EUROPEAN PATENT OFFICE, <https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar56.html> (last visited Nov. 3, 2019).

⁴³ BENTLY ET AL. at 582.

⁴⁴ See *Decision of Technical Board of Appeal* (Sept. 26, 2002), <https://www.epo.org/law-practice/case-law-appeals/pdf/t000641ep1.pdf> (last visited Nov. 3, 2019).

will be someone skilled in data processing, and not merely a businessman, actuary or accountant.”⁴⁵

For this reason, as it relates to the perspective of a person skilled in the art, there are three major instances in which a patent application can be invalidated or rejected due to insufficient disclosure. These instances can occur either during the patent examination by the patent office or even after a patent was granted.

The first instance of disclosure insufficiency is classical insufficiency.⁴⁶ Such a situation was assessed in a UK case, *Mentor Corporation v. Hollister Incorporated*, where the court analyzed the meaning of “person skilled in the art” as it relates to patent claims.⁴⁷ Justice Lloyd L.J. reasoned:

“Further, we are of the opinion that it is not only inventive steps that cannot be required of the addressee. While the addressee must be taken as a person with a will to make the instructions work, he is not to be called upon to make a prolonged study of matters which present some initial difficulty: and, in particular, if there are actual errors in the specification-if the apparatus really will not work without departing from what is described-then, unless both the existence of the error and the way to correct it can quickly be discovered by an addressee of the degree of skill and knowledge which we envisage, the description is insufficient.”⁴⁸

Due to classical insufficiency, a patent application will not be granted or an issued patent may be invalidated if the disclosure was not properly made in the claim. Consequently, a person skilled in the art cannot work on a claim and reach a similar result.

Bently, Sherman, Gangjee & Johnson provide some useful insights as to what would qualify as an insufficient disclosure.⁴⁹ They argue that a person skilled in the art does not need to

⁴⁵ *Id.* at 9.

⁴⁶ BENTLY ET AL. at 602.

⁴⁷ *Mentor Corp. v. Hollister Inc.* (1993) R.P.C. 7 (Eng.)

⁴⁸ *Id.* at 13.

⁴⁹ BENTLY ET AL. at 602-603.

use any inventive step to achieve the same result of the patent.⁵⁰ Instead, based on common general knowledge, this person shall be entitled to rebuild the invention by applying the information disclosed in the application.⁵¹ Likewise, if the person skilled in the art cannot rebuild the invention, the disclosure was not done in a manner that allowed the sharing of new knowledge.⁵² Accordingly, the patent will be invalid or the application will not be granted due to insufficient disclosure. Moreover, the person skilled in the art shall not be required to incur an unreasonable burden to reconstruct the invention. In case that occurs, it also means that the invention was not completely disclosed; hence, a patent application will not be granted or an issued patent should be invalidated.⁵³ Because the patent holder enjoys twenty years of monopoly protection, the system wisely portends that society should not incur a cost to recreate innovation.

In the 2006 UK case *Halliburton Energy v. Smith International*,⁵⁴ the court of appeal of England and Wales heard an appeal related to software. Lord Jacob wrote the ruling that was unanimously followed by the court. On one side, Halliburton claimed that Smith International created software by applying some concepts that, under Halliburton's opinion, infringed two patents of a cone drill used in the oil extraction industry. Smith International counterclaimed, arguing the patent granted to Halliburton should be revoked. At the trial court, Sir Pumfrey J. ruled that, even though part of Smith's invention would infringe the scope of Halliburton's patents,

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Halliburton Energy Services Inc. v. Smith International (North Sea) Ltd. & Ors.*, [2006] EWCA Civ 1715 (Eng.), <http://www.bailii.org/ew/cases/EWCA/Civ/2006/1715.html> (last visited Nov. 10, 2018).

⁵⁴ *Id.*

these patents should be invalidated on the basis that they were not sufficiently disclosed for a person skilled in the art.⁵⁵

Lord Jacob provided a very thoughtful insight as to what constitutes a sufficient disclosure.

In his own words:

“A patent is supposed to teach people how to perform the invention. If necessary, information is not actually in the patent, then the skilled person must be given a clear unambiguous direction of where to get it. He cannot be expected to find such a direction buried in acknowledgements of the prior art. Ultimately the question is one of construction – does the patent clearly teach the skilled addressee how to perform the invention?”⁵⁶

This specific paragraph is of tremendous value to this study. It summarizes how the social contract bargain shall be performed by the patentee. If the patent disclosure does not reach the goal of teaching the person skilled in the art due to a lack of essential information, no monopolistic protection should be granted.

This case is relevant for several reasons. First, it assesses the discussion of reference to other documents. It also advances the concept that a person skilled in the art may not be an individual. Still, for the purposes of this article, the idea is to assess how the court had reached the conclusion that the invention was not properly disclosed, as an example of classical insufficiency.

The second instance of disclosure insufficiency deals with “insufficiency due to excess of breadth.”⁵⁷ It is sometimes referred to as “the Biogen Test,” as a result of Lord Hoffmann’s ruling in *Biogen v. Medeva*.⁵⁸ This insufficiency due to excess of breadth occurs in incomplete patent applications that account for large sets of hypotheses. It happens when the patentee does not

⁵⁵ *Id.*

⁵⁶ *Id.* at Item 67.

⁵⁷ BENTLY ET AL. at 603.

⁵⁸ *Biogen Inc. v. Medeva PLC*, [1996] U.K.H.L. 18 (Eng.), <https://www.bailii.org/uk/cases/UKHL/1996/18.html> (last visited Nov. 10, 2019).

disclose comprehensive information that would allow the person skilled in the art to use the entire claimed invention. Consequently, part of the social benefit of sharing know-how is simply nonexistent. Accordingly, no monopoly should be granted to the inventor. In such a scenario, the courts had widely accepted the plausibility test, which suggests that a patent with a general and large claim should be withheld if there is a reasonable possibility that the invention would work in all compounds.⁵⁹

Even though this approach sounds attractive, one downside is it creates a monopoly reward that, if granted, will create an imbalance in the benefit generated to the society; i.e., it becomes possible to speculate that the inventor will earn a monopoly in a compound that has some chance of failure. Such failure will likely account for a decrease in the level of investment in research on that specific compound; first, because there is a low likelihood of return over the investment and second, because there are high chances of violating a patent and facing an expensive patent litigation. Consequently, society will not experience any benefit from such a situation.

As mentioned above, a credible guideline of insufficiency due to excess of breadth can be found in the decision issued by the United Kingdom House of Lords in 1996, *Biogen v. Medeva*.⁶⁰ In this case, Lord Hoffmann first conceptualized what is currently known as the Biogen Test. In 1978, Biogen filed a patent with the United Kingdom Patent Office claiming the company developed technology which allowed an artificial reconstruction of a genetic code embodied in a DNA molecule that, once introduced in the host cell, could make antigens of the virus hepatitis.⁶¹ Such a patent would be used as a basis to obtain a priority date for a subsequent application that

⁵⁹ BENTLY ET AL. at 604.

⁶⁰ *Biogen Inc. v. Medeva PLC*, [1996] U.K.H.L. 18 (Eng.), <https://www.bailii.org/uk/cases/UKHL/1996/18.html> (last visited Nov. 10, 2019).

⁶¹ *Id.* at Section 11.

was filed in the European Patent Office. Nevertheless, in 1992, Biogen decided to file a patent infringement suit against Medeva, which was proposing to market what was described as a third-generation hepatitis B vaccine, made by recombination DNA technology in colonies of mammalian cells.⁶² Naturally, Medeva counterclaimed that Biogen's patent was invalid under (among other reasons) the assumption that the description in the specification was insufficient according to section 72(1)(c) of UK Patent Act.⁶³

This case has various important lessons; however, for the purposes of this article, the most relevant lesson becomes how the court interpreted the concept of broad patents. This arrives in the ruling drafted by Lord Hoffmann:

“If the invention discloses a principle capable of general application, the claims may be in correspondingly general terms. The patentee need not show that he has proved its application in every individual instance. On the other hand, if the claims include a number of discrete methods or products, the patentee must enable the invention to be performed in respect of each of them.”⁶⁴

Finally, the third instance of disclosure insufficiency arises when the disclosure is ambiguous.⁶⁵ In *Unwired Planet International Limited v. Huawei Technologies*, Justice Birrs suggests that insufficiency due to ambiguity will take place when the disclosure is infeasible for a person skilled in the art to learn and reconstruct the invention.⁶⁶ Justice Birrs explained, “As I

⁶² *Id.* at Section 12.

⁶³ *See*, UK Patent Act. Article 72,1,C: “Subject to the following provisions of this Act, the court or the comptroller may by order revoke a patent for an invention on the application of any person (including the proprietor of the patent) on (but only on) any of the following grounds, that is to say: (..) (c) the specification of the patent does not disclose the invention clearly enough and completely enough for it to be performed by a person skilled in the art...”

⁶⁴ Biogen at Section 63.

⁶⁵ *Unwired Planet International Ltd. v Huawei Technologies Co., Ltd & Ors* [2016] E.W.H.C. 576 at Section 148 (Eng.), <https://www.bailii.org/ew/cases/EWHC/Patents/2016/576.html#para148> (last visited Nov. 3, 2019).

⁶⁶ *Id.* at Section 148-177.

mentioned already, if the directions in the specification are so ambiguous that the invention cannot be put into practice, then it is insufficient.”⁶⁷

Such ambiguity can be especially relevant when applied to patentability of algorithms, since there are a relevant number of algorithms that are criticized due to their lack of transparency.⁶⁸ Bently, Sherman, Gangjee & Johnson lay out a practical distinction to determine ambiguity in disclosure.⁶⁹ They write that: “In this context a distinction is drawn between a fuzzy (or unclear) claim which is a by-product of the difficult task of trying to describe an invention in words (which is not objectionable) and, on the other, a truly ambiguous claim (which is objectionable).”⁷⁰ In other words, to the extent that ambiguity of the claim does not permit that a person skilled in the art understands whether or not they are taking the right steps to recreate the invention, the patent application shall not be granted or the patent shall be invalidated on the basis of ambiguity in the disclosure.

Accordingly, the European Patent Office guidelines provide a very clear instruction on how insufficiency due to ambiguity will be qualified:

“What is decisive for establishing insufficiency within the meaning of Art. 83 is whether the parameter, in the specific case, is so ill-defined that the skilled person is not able, on the basis of the disclosure as a whole and using his common general knowledge to identify (without undue burden) the technical measures necessary to solve the problem of the underlying application at issue (...)”⁷¹

⁶⁷ *Id.* at Section 156.

⁶⁸ *Guidelines for Examination – Part F, Chapter III, Item 11*, EUROPEAN PATENT OFFICE, <https://www.epo.org/law-practice/legal-texts/html/guidelines/e/index.htm> (last visited Dec. 10, 2019).

⁶⁹ BENTLY ET AL. at 607.

⁷⁰ *Id.*

⁷¹ *Case law of the Boards of Appeal*, EUROPEAN PATENT OFFICE, https://www.epo.org/law-practice/legal-texts/html/caselaw/2016/e/clr_ii_c_7_2.htm.

In all three of the above-mentioned cases, sufficient disclosure played a pivotal role in seeking the assurance that the patentee, seeking to benefit from the incentives given by the patent, actually provided a meaningful contribution to the scientific community; even if that contribution involved nothing more than sharing knowledge. Under this assumption lies the normative basis of disclosure.

However, although the patent system has made considerable improvements, the high volume of overly broad patents poses a threat in the system's ability to enable the public. Thus, the next section will explore policy strategies to improve the patent system disclosure function.

IV. TACKLING DISCLOSURE GAPS WITHIN THE PATENT SYSTEM: SOME SUGGESTIONS

Despite all the efforts in the guidelines and caselaw issued by the courts, generally, patent lawyers, scholars and policy makers acknowledge that patent systems across the globe struggle with a large number of patent applications.

As a result of this large number of patents applications, patent offices do not pay enough attention to effectiveness of the disclosure; i.e., they do not deeply assess the existence of prior art. If these two requirements are neglected, the quality of any issued patent will be lowered. Patentees, on the other hand, sometime take advantage of such deficiencies and file patents which do not actually fulfill the requirement of proper disclosure. These two combined elements have been detrimental to society and have caused a steady increase in patent litigation in recent years.⁷²

⁷² According to a study published by PriceWaterhouseCoopers, from 2009 to 2014, the numbers of patent grants and patents litigation suffered a sharp increase in United States. The patent grants soared from roughly 190.000 to almost 290.000, and litigation increased from 2.500 to 6.500 cases. *2014 Patent Litigation Study*, PwC, <https://www.pwc.com/us/en/forensic-services/publications/assets/2014-patent-litigation-study.pdf> (last visited Nov. 11, 2019).

Under these circumstances, there are five proposals which have been presented by three scholars that might improve the disclosure function of the patent system and increase the efficiency and welfare of software patentability. The first two proposals may be applied to the patent system overall, whilst the others are more oriented to software patentability.

A. STRATEGY #1: SEPARATING THE LEGAL FROM THE TECHNICAL

Lecturer Jeanne Fromer⁷³ suggests an amendment in the patent application document. As Fromer points out, the patent application description involves a combination of legal and technical language within the same section of the application. Such combination may lead to a misconception about the patent extension. Ultimately the audiences of these two languages are indeed diverse; the legal language targets patent lawyers and the technical language targets researchers and innovators. Therefore, once the application merges these two languages it, perhaps, jeopardizes the information function of the patent system without accomplishing its goal of sharing the knowledge.⁷⁴

To address this issue, Fromer proposes to separate the legal layer from the technical layer.⁷⁵ Accordingly, it would be of great value to ensure that the technical details are presented in a format that would be more appropriate for the person skilled in the art to learn and rebuild the invention; whilst the legal layer would be more focused to attend courts so as to rebuild the legal limits of the patent claim.⁷⁶ Fromer further clarifies that these two layers will make it possible for the person

⁷³ Jeanne C. Fromer, *Patent Disclosure*, IOWA L. REV. 564-569 (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1116020 (last visited Nov. 10, 2019).

⁷⁴ *Id.* at 569.

⁷⁵ *Id.* at 569-571.

⁷⁶ *Id.* at 570.

skilled in the art to rebuild the knowledge to its full extension without undue experimentation. Afterward, the courts will interpret this full extension using legal analysis.⁷⁷

Our next three suggestions to improve the disclosure function are all presented by Professor Jay Kesan of the University of Illinois College of Law. Kesan's research begins by recognizing that patentees have little incentive to conduct a comprehensive study of prior art.⁷⁸ Instead, the inventors are only required to disclose prior arts that are available to them.⁷⁹ Consequently, the burden of assessing quality of the disclosure and inventive step lies in the understaffed and overloaded patent office.⁸⁰ In addition, once the patent is issued, the legal system will grant a statutory presumption of validity, making it harder for someone to invalidate a patent application due to lack of disclosure, for example. Focusing on how an improved disclosure function can help computer-implemented inventions, this article now proposes three strategies that would enhance the system.

B. STRATEGY #2: AN ENHANCED PRIOR ART DISCLOSURE PROCESS

The first relevant strategy presented by Kesan⁸¹ involves an enhanced process for prior art disclosure.⁸² He portends that the patentee should expand disclosure of prior arts. Kesan argues that the patentee should include how the claim fulfills the patentability requirement of usefulness, novelty and technical application over prior existing art. Therefore, only if the inventor adopts this path in the patent application will the patentee hold the statutory validity that is currently held

⁷⁷ *Id.*

⁷⁸ *Id.* at 153

⁷⁹ *Id.*

⁸⁰ According to WIPO, innovators across the globe filed 3.3 million patents in 2018. *World Intellectual Property Indicators: Filings for Patents, Trademarks, Industrial Designs Reach Record Heights in 2018* WIPO, https://www.wipo.int/pressroom/en/articles/2019/article_0012.html (last visited Nov. 3, 2019).

⁸¹ Kesan at 145- 152.

⁸² *Id.* at 155-157.

by any patent. This approach is beneficial for everyone in the patent environment: society will be in a better position to gain knowledge from the patent application, the under-resourced patent and trademark offices across the globe will benefit from a reduction of the asymmetry of information and inventors will be less likely to have post-issuance litigation related to their patented products.⁸³

C. STRATEGY #3: WITHHOLDING STATUTORY PRESUMPTION OF VALIDITY

Kesan presents another mechanism as an alternative to the above-mentioned suggestion.⁸⁴ He reasons that, if the patentee does not have enough incentives to elect the enhanced disclosure path for the patent application, the patent should not be presumed as statutorily valid.⁸⁵ In other words, the benefit that is granted to society with an enhanced disclosure process is not the same as what inventors typically disclose if the burden of prior art analysis is allocated to the patent office. Thus, society should not have to overcome a presumption of validity (which increases social costs) to invalidate and/or restrict a patent that does not add much value to the scientific community.

D. STRATEGY #4: APPLYING REPRESENTATIONAL LANGUAGES

Kesan's final⁸⁶ strategy (as it relates to our notion of improved disclosure) consists of the requirement of the use of representational languages in the specification of software patents. Kesan criticizes what he refers to as a "false translations problem,"⁸⁷ essentially saying that patent applications should not advance descriptions that use different terminologies that might be relevant and understandable by few peers who belong to the same organization of the innovator.⁸⁸

⁸³ *Id.*

⁸⁴ *Id.* at 157-158.

⁸⁵ *Id.*

⁸⁶ While in this paper we are calling this as a last strategy, in Kesan's paper this is his fourth strategy.

⁸⁷ Kesan at 166.

⁸⁸ *Id.*

According to him, this jeopardizes any ability that further inventors will have to understand what the actual prior art really is at the time of the patent application. Such a condition has decreased the incentives that inventors must seek patentability of a software-implemented invention. In other words, if an inventor decides to patent a software invention, the innovator will risk that their invention breaches another patented software with the same features.⁸⁹

E. STRATEGY #5: A DEPOSITORY MECHANISM

In 2007, Samuel C. Adams advanced yet another suggestion.⁹⁰ In his work, Adams comprehensively assessed intellectual property law, software, patents and disclosure through the lens of both legal and economic principles.⁹¹ While acknowledging that software patents are typically a field of incremental innovation; Adams further ascertained that the disclosure mechanism of the software patent market is not performing at its best. He goes further and suggests that a mandatory disclosure of software source code might in fact hurt the patent system.⁹² Moreover, he believes that innovators will likely keep their innovation secret because the disclosure of source code might increase the ability of thefts to copy the invention.⁹³ It is in this scenario that he makes a relevant and, perhaps, fundamental connection that might take software patentability to a safe harbor. He advocates that software patentability should employ a similar depository mechanism as the one currently in use in the biotechnology patents.⁹⁴

⁸⁹ *Id.* at 167-168.

⁹⁰ Samuel C. Adams, *Law and Economics of Software Patent Disclosure*, THE MUNICH INTELLECTUAL PROPERTY CENTER (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1415722 (last visited Nov. 10 2019).

⁹¹ *Id.*

⁹² *Id.*

⁹³ *Id.* at 39-41.

⁹⁴ *Id.* at 41-46.

According to Adams, a depository scheme should observe three requirements.⁹⁵ First, even though the software applicant might deposit the source when filing the application, such code will be unavailable until the patent is granted and published. This balance will assure that if the patent is not granted for any reason, the inventor retains the ability to seek another format of protection (e.g., trade secret).⁹⁶ Second, a request for a source code must require a digital signature.⁹⁷ The identification of the requester would be supplied to the patent holder, assuming that this could increase the value of the patent by approximating technology holders to potential licensees.⁹⁸ Third, deposit would be critical to ensure standardization, security and impartiality.⁹⁹

F. SYNTHESIZING THE STRATEGIES

After reading each strategy it is tempting to believe that, once they are implemented to their full extent, they might add relevant drawbacks and bureaucracy in promoting innovation. Nevertheless, these strategies, if implemented in full by policy makers, will much likely go the opposite way. First, the patent system will only be used by those inventors that are willing to take full advantage of the system, thus the incentives for an inventor to spend more resources in the patent disclosure are greater in comparison to the incentives of an inventor of a limited usefulness patent. Second, by aligning frameworks, it will improve the transparency and subsequent trade-off of disclosing the underlying knowledge. Consequently, the quality of the scientific disclosures is likely to increase in the long-term, allowing innovators to learn what has been built and innovate further. Lastly, relating back to algorithm-based software, an important strategy is to assure

⁹⁵ *Id.*

⁹⁶ *Id.* at 42.

⁹⁷ *Id.* at 43.

⁹⁸ *Id.*

⁹⁹ *Id.* at 44.

connectivity among the devices. For instance, autonomous vehicle algorithms shall interface with other vehicles, otherwise, potential consumers will have credible safety restrictions. To achieve the desired outcome, an understanding of the source code is of fundamental importance.

In summary, although there is a credible concern that the patent system is not promoting the welfare that is expected,¹⁰⁰ the combined implementation and application of these ideas can take the patent system closer to such a goal. Once such a goal is achieved, software-related companies can be viewed in a completely different manner. Following this pattern, the next section will debate the current stage of software patentability.

V. THE CURRENT LANDSCAPE

Generally, patent systems provide that a mere scheme, rule or method for performing a mental act, playing a game, doing a business or a computer program, are not eligible subject matter for patent protection.¹⁰¹ Under this scenario, it would be inevitable to assume, just like Andrew Murray has suggested, that no further discussion should be necessary for software patentability.¹⁰² Nevertheless, the reality presents a completely different approach. Therefore, this section will explore how the patent system has evolved, how the doctrine of the technical effect and something more can affect this debate.

This discussion related to software patentability began in 1949 in the United Kingdom courts, when an inventor by the name of Mr. Gevers invented a data processing operation using a

¹⁰⁰ ANDREW MURRAY, INFORMATION TECHNOLOGY LAW 262 (Oxford, 3rd ed. 2016).

¹⁰¹ Art. 52, 2 of European Patent Convention provides: “The following in particular shall not be regarded as inventions within the meaning of paragraph 1: (a) discoveries, scientific theories and mathematical methods; (b) aesthetic creations; (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers; (d) presentations of information.”

¹⁰² Murray at 262.

punch card to index trademarks and seek similarities. He applied for a patent that would configure a manner of manufacture.¹⁰³ The officer of the UK Patent and Trademark Officer held that “the subject matter of the invention would seem to be a 20 scheme or plan which, although it might be ingenious and useful, was not a patentable invention within the meaning of section 101 of the Act.”¹⁰⁴ Mr. Gevers then filed a lawsuit to have his patent granted. Justice Graham J. granted the appeal and deferred the patent on the basis that his invention was likely a cam control and could be distinguished from a typical punch card with written instructions.¹⁰⁵

The system evolved in 1986 when the European Patent Office board issued a decision which became known as the technical effect approach.¹⁰⁶ This was a first attempt to draw the line of what would qualify as a computer-implemented invention subject to patent protection.¹⁰⁷ The European Patent Office’s board decision provided that:

“Generally speaking, an invention which would be patentable in accordance with conventional patentability criteria should not be excluded from protection by the mere fact that for its implementation modern technical means in the form of a computer program are used. Decisive is what technical contribution the invention as defined in the claim when considered as a whole makes to the known art.”¹⁰⁸

In the United States of America, a similar situation happened in 1998, when the US Court of Appeals for the Federal District assessed the case of *State Street Bank & Trust Co v. Signature Financial Group*.¹⁰⁹ In summary, Signature Financial Group (“Signature”) developed a

¹⁰³ Gevers Application [1969] FSR 480.

¹⁰⁴ *Id.*

¹⁰⁵ Murray at 263.

¹⁰⁶ Vicom Systems, Inc., No. T 208/84 (EPO Technical Board of Appeal 3.5.1, July 15, 1986), <https://www.epo.org/law-practice/case-law-appeals/pdf/t840208ep1.pdf> (last visited Nov. 10, 2019).

¹⁰⁷ Murray at 264.

¹⁰⁸ Vicom Systems, Inc.

¹⁰⁹ *State St. Bank & Tr. Co. v. Signature Fin. Grp., Inc.*, 149 F.3d 1368 (Fed. Cir. 1998).

proprietary system which had enabled mutual funds to pool their assets in an investment portfolio, under a partnership structure. Justice Rich wrote the majority, which stated, “Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not “useful.” From a practical standpoint, this meant that an algorithm must be applied in a “useful” way to be patentable.¹¹⁰

Finally, another relevant case related to what makes a mathematical algorithm patentable is “Alice” and “Something More.”¹¹¹ This was a ruling issued by the Supreme Court of the United States in October of 2013.¹¹² The case debated whether or not a method of exchanging financial obligations embodied in a computer system would be patentable under the United States Patent Act. The ruling was unanimous; with the Court holding that the method, whilst in a new platform, did not change what was already known by science. The opinion of the Court was drafted by Justice Thomas and provided a very pragmatic and intuitive approach on how to assess software patentability. He sustained his opinion by giving examples of building blocks and something more. According to his point of view, when assessing the exception provided by law, the courts should distinguish between these blocks and something more. Consequently, if the patent disclosure is just providing coordination or integrating things that are already known to humans, such a patent would not qualify as invention; and therefore, should not be subject to patent protection.

The reason for that interpretation is that the patent applicant had not added any relevance to society’s general knowledge. Within this scope, the “Something More” doctrine consists of an

¹¹⁰ *Id.*

¹¹¹ Siva Tanbisetty, *Alice and ‘something more’: the drift towards European patent jurisprudence*, 3.3 JOURNAL OF THE LAW AND BIOSCIENCES, 691-696 (2016) <https://academic.oup.com/jlb/article/3/3/691/2548353>.

¹¹² *Alice Corp. Pty. v. CLS Bank Int’l*, 573 U.S. 208, 134 S. Ct. 2347, 2349, 189 L. Ed. 2d 296 (2014).

understanding that, if the patentee adds relevant knowledge to the system (i.e., something more), then they should be awarded the monopoly of patent protection. Justice Thomas went further, providing a signal to the patent market. He wrote: “This Court has long ‘warn[ed] ... against’ interpreting § 101 ‘in ways that make patent eligibility ‘depend simply on the draftsman's art.’”¹¹³

While the technical effect and the “Something More” case briefly explained above are not the main topic of this paper, it is interesting to point out that both of these cases (in addition to the strategies presented in the prior section) are clearly aiming to create incentives to inventors to demonstrate the actual contributions of their invention. After all, it is all about how an effective disclosure can contribute to the society learning process.

However, this is not to defend that the disclosure is working efficiently. We may acknowledge that dependence in the draftsman’s art, the high volume of abstract claims and perhaps the twenty years monopoly,¹¹⁴ altogether, may not be the best model to promote innovation..

The next section will explore the autonomous vehicles algorithm by analyzing the issues related to algorithms and software. We will also look at how these issues can be addressed by using the patent disclosure benefits debated throughout the article.

¹¹³ *Id.* at 2351.

¹¹⁴ While it is not the topic of this paper, it is important to mention that a twenty years patent monopoly protection is a long period considering that, twenty years ago, smartphones were not in the market, for example. Thus, it is important to debate this protection period for the contemporary world. Eventually, a rediscussion of TRIP’s agreements is required to acclimate patent protection to present time where innovation will not be held innovative for twenty years.

VI. PROPOSING A DIALOGUE

The purpose of this section is to explore the dialogue between the benefits of an enhanced disclosure patent system and the challenges faced by algorithm-based software. To achieve this goal, we will investigate algorithm-based software challenges and demonstrate how, in applying certain strategies, we can address these overriding challenges. Autonomous vehicles technology was chosen as our model because it is most suitable for the comprehension of a non-technological individual. However, this same analysis can be made by using an automated trader system or autonomous weapon.

Initially, it is important to understand Andrew Tutt's explanation of algorithms.¹¹⁵ According to Tutt, algorithms are merely detailed instructions to solve a specific task.¹¹⁶ Software that utilizes artificial intelligence can read data, check for additional patterns, and learn from these patterns. Such development is encoded under a complex data structure, without human interference.¹¹⁷ Once these new patterns have been incorporated into the system, the software will make decisions or provide information considering this new set of data.¹¹⁸

We can infer from Tutt's explanation above that software that utilizes machine-learning, is subject to uncertainty and lack of knowledge not only by society, but also developers. In other words, it is fairly complicated to understand the software code, especially when such software would be harming the society as a result of its learning capabilities.

¹¹⁵ Andrew Tutt, *An FDA for Algorithms*, 69 ADMIN. L. REV. 83, 84-85 (2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2747994.

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *Id.*

Under this scenario, if the patent protection system shifts and software patentability becomes clearer for developers, it is possible to imagine that the disclosure requirement will popularize an understanding of these systems and perhaps even the machine-learning algorithm. Consequently, this development will allow inventors to address these risks and improve the system, creating a virtuous and positive cycle.

Tesla and Uber provide great examples of opaque algorithm consequences. An algorithm is “opaque” if it utilizes certain types of data that some users do not realize they are providing.¹¹⁹ In the case of Tesla, there are two known accidents that happened; one in May 2016 and the other in early 2019.¹²⁰ In the first example, Tesla’s autopilot system failed to detect a trailer on the street and caused the death of a driver.¹²¹ In the second accident, the same software did not recognize a concrete barrier and crashed the car, leading to the death of another driver. In response to the first accident, Tesla issued a software update; yet it did not fix the system and could not prevent the second death.¹²²

Uber, a company that employs a total autonomous system in its vehicles, faced a similar situation on March 18, 2018. The company’s autonomous vehicle crashed and killed Elaine Herzberg, a 49-year-old woman in Tempe, Arizona.¹²³ According to Arizona’s traffic safety

¹¹⁹ *The Senate’s Secret Algorithm Bill Doesn’t Actually Fight Secret Algorithms*, THE VERGE, <https://www.theverge.com/2019/11/5/20943634/senate-filter-bubble-transparency-act-algorithm-personalization-targeting-bill> (last visited Jan. 2, 2020).

¹²⁰ Sam Levin, *Tesla fatal crash: ‘autopilot’ mode sped up car before driver killed, report finds*, THE GUARDIAN, <https://www.theguardian.com/technology/2018/jun/07/tesla-fatal-crash-silicon-valley-autopilot-mode-report> (last visited Nov. 11, 2019).

¹²¹ *Id.*

¹²² *Id.*

¹²³ Associated Press, *Uber’s self-driving SUV saw the pedestrian in fatal accident but didn’t brake, officials say*, CNBC, <https://www.cnbc.com/2018/05/24/ubers-self-driving-suv-saw-the-pedestrian-in-fatal-accident-but-didnt-brake-officials-say.html> (last visited Nov. 11, 2019).

regulators, although the system had recognized Mrs. Herzberg, the system was not connected to the brake system and, as a result, could not prevent the collision.

These cases share at least three important similarities. First, all three cases resulted in the death of a person. Second, they are related somehow to a failure in an opaque software. Third, it was a herculean effort to determine what specifically had caused the accidents. Likewise, a proper disclosure of autonomous vehicle software code—under a mature patent system regime—might be the most relevant strategy; one that policy makers could apply to avoid accidents, as the number of autonomous vehicles is no doubt likely to increase in the coming years.

These examples also demonstrate that there is room to improve algorithm-based software, mainly when it comes to opaque¹²⁴ algorithms capable of threatening a human's life or their welfare. Consequently, if technological developers had sufficient incentives to file for a patent of their algorithm-based software systems, society would reap multiple benefits.

To begin with, inventors would be granted with a monopoly for their invention without risking an improper disclosure of the software source code. This, considering that the source would be safely storage in a depository (strategy above); just like what happens with and biotech genes discovery. This benefit might avoid a situation related to the leaking of a trade secret, for instance.¹²⁵ Second, the knowledge that would have been shared in a common language (last strategy above) with society would likely have accelerated further development. Eventually new software would have been released and such software might have prevented deaths in the streets,

¹²⁴ The opaque term refers to a system in which an ordinary person cannot understand why the technological system took a particular action. Harry Surden and Mary-Anne Williams, *Technological Opacity, Predictability, and Self-Driving Cars*, 38 CARDOZO LAW REVIEW 158.

¹²⁵ See *Waymo accepts \$245 million and Uber's 'regret' to settle self-driving car dispute*, REUTERS, <https://www.reuters.com/article/us-alphabet-uber-trial/waymo-accepts-245-million-and-ubers-regret-to-settle-self-driving-car-dispute-idUSKBN1FT2BA> (last visited Nov. 11, 2019).

a disruption in the financial market or even a military disaster; taking into account capabilities of automated trader and autonomous weapons for example. In exchange, the patentee would have a much greater protection against infringement, because the disclosure was properly done and prior art was clearly revealed according to the first strategy above. Third, there is a competing rush for building artificially intelligent software. This rush is putting into the market systems that have not yet been proven safe. In contrast to what is happening under copyright protection system, a proper disclosure in the patent system would not allow unsafe systems under an exclusion criterion. Moreover, the investment criteria in these systems could be wisely allocated, because an enhanced disclosure for algorithm-based patent system would play a role in demotivating duplication of investments. Finally, the connectivity of the new world would possibly be in a better position, taking into account that the various business players may be required to understand the underlying technology of the other players. In other words, the disclosure would allow that players get educated in regard what features are presented by competing software. Likewise, these systems would be efficiently integrated and the environment better connected.

VII. CONCLUSION

As a result of the fast development of technology, algorithm-based computer software has become an ever-increasing challenge for policy makers, lawyers and ultimately citizens. This article has demonstrated that, even though the debate of enhanced disclosure is not a debate only related to software patentability, this field of technology certainly is one of the most-impacted by the disclosure illness of the patent system.

Above, it was presented that an understanding of the foundations and justifications of the patent system is of fundamental importance to solving these larger issues. The improved just

reward theory is the basis on which the disclosure institute is built, thus serving as the basis in which lawyers and policy makers shall interpret the system.

This is not to say that the system is complete. In fact, the challenges that we demonstrate here suggest the opposite. New challenges posed by algorithm-based software, for example the autonomous vehicle, are a clear indication that the disclosure function is outperforming. To revert this index, this article presented five suggestions that could be applied, without undue burden to society and/or inventors.

Whatever solution policymakers adopt, the fundamental goal should be to restore the balance of the social contract bargain. To forge a successful rebalance, improvements in the disclosure mechanism need to be at the center of the debate.

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